

P. Z. S. 1913, p. 19 (April 15)], cannot, indeed, be described as a "Rooi" (red) Hartebeest; and is evidently a form which is either losing or acquiring—I cannot say which—the rufous body-colour and deep purplish-black markings of the typical southern Kibama. The two races may be defined as follows:—

- a. General colour rich rufous-brown; face-blaze black and extending, with the exception of a narrow fawn band between the eyes, from horns to muzzle; limb-markings plum-colour, and forming a continuous stripe on front of fore-legs.

B. caama typica.

- b. General colour yellowish fawn; face-blaze mingled with tawny, stopping short of horns and muzzle, and interrupted by a long interval in region of eyes; limb-markings mingled with tawny, interrupted above knees, on which they form a cap, and represented by a small patch on front of shanks.

B. caama selbornei.

46. On a Collection of Mammals from the Inner Hebrides.
By G. E. H. BARRETT-HAMILTON, F.Z.S., and MARTIN
A. C. HINTON.

[Received and Read April 8, 1913.]

(Plate LXXXIV.* and Text-figures 136–138.)

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The peculiar mammals of high interest yielded by investigation of the peripheral regions of the British Islands, led Barrett-Hamilton to believe that further valuable results might be obtained by a closer study of the mammals of the Scottish Islands. The despatch and management of collectors was, however, an undertaking beyond his means and available time, and the matter hung fire until taken up by Mr. W. R. Ogilvie-Grant, whose enthusiasm as manager and collector of funds has made it possible to amass the material on which this paper is based.

Early in 1912 Mr. R. W. Sheppard was sent to the Inner Hebrides, and commencing to collect at Bute, this young naturalist gradually worked his way northwards through the group as far as Coll, which he reached in July. As small mammals are difficult

* For explanation of the Plate see p. 839.

to catch during the summer months, further investigation of the islands was then postponed.

Among those who have assisted the work of exploration, either financially or with local assistance, we may specially mention the Duke of Argyll, the Marquis of Bute, Mr. A. R. Macgregor, Mrs. Hugh Morrison of Islay, Mr. Colin Campbell of Jura, and Mr. Harold Russell.

The present collection has come well up to expectations, since it has resulted in the discovery of three quite distinct forms belonging to the genera *Sorex*, *Evotomys*, and *Microtus**.

In working out the fauna of small islands, two distinct phenomena must be disentangled. A peculiar mammal found on a small island may represent a new development under insular conditions, it may represent the survival of an ancient type elsewhere extinct, and, as is often the case, it may combine both features. We believe that *Sorex grantii* is an entirely new development, and that *Evotomys alstoni* and *Microtus agrestis macgillivraii* are instances of "relics" surviving with little alteration from the pleistocene epoch. The meaning of these three forms has been partly discussed under the description of each of them; but it would be premature to enter upon an extended discussion of the cause of variation or survival in islands. The influence of a comparatively recent glacial period, and the extermination brought about by man, now proved to be an ancient inhabitant of Britain, are difficult to follow; and at all periods the British Islands have been the scene of constantly shifting environments and altering or variable climates, due principally to the proximity of a great ocean and the frequent oscillations of sea-level. Many of our common genera of mammals have inhabited the British Islands since the deposition of the late pliocene Forest-Bed, but no one has as yet ventured to guess how often they may have been exterminated, to return again in fresh vigour on the resumption of favourable conditions. The history of the British fauna resolves itself into that of the various invasions or "migrations" of mammals, which have been no less real, albeit more ancient and more difficult to trace, than those of Kelt, Roman, Saxon, Skandinavian, and Norman. The severity of the struggle for existence has in our area undergone profound variation, according as the sea cut off or united our area with Europe, according as severe climatic conditions were combined with insularity or connection with the Continent. But, however frequently the fauna may have been exterminated, renewed junctions with the mainland have from time to time refreshed it with new stock, and the geological records of what seem from a distance almost kaleidoscopic changes are only now in process of disentanglement.

* [The complete account of these new forms appear here, but since the names and preliminary diagnoses were published in the 'Abstract,' No. 119, 1913, they are distinguished by being underlined.—EDITOR.]

SOREX ARANEUS CASTANEUS Jenyns. (Pl. LXXXIV. fig. 2.)

Three, GREAT CUMBRAE.

Dimensions *:—

			Head & body.	Tail.	Hind foot.
No. 34, male,	28 March 1912	.....	70	33	12
32, female,	27 „ „	.....	70	33	13
39, „	30 „ „	.....	67	32	11
Average of 3 specimens of both sexes :—			69	32·6	12

Eight, BUTE.

No. 13, male,	19 March 1912	.....	70	37	12
65, „	18 April „	.....	77	33	12
68, „	19 „ „	.....	70	32	12
71, „	20 „ „	.....	70	36	12
14, female,	19 March „	.....	65	32	12
15, „	„ „ „	.....	65	32	12
16, „	„ „ „	.....	65	33	12
66, „	„ „ „	.....	73	32	12
Average of 8 specimens of both sexes :—			69·37	33·37	12

Three, ARRAN.

No. 58, male,	10 April 1912	.....	72	36	12
57, female,	„ „ „	.....	70	36	12
60, „	11 „ „	.....	75	36	12
Average of 3 specimens of both sexes :—			72·33	36	12

Four, MULL.

No. 143, male,	29 June 1912	.....	78	35	12
144, „	3 July „	.....	75	33	12
138, female,	21 June „	.....	68	40	12
142, „	28 „ „	.....	68	38	12
Average of 4 specimens of both sexes :—			72·25	36·5	12

Six, JURA.

No. 108, male,	15 May 1912	.....	70	36	12
110, „	„ „ „	.....	73	35	12
112, „	16 „ „	.....	76	36	12
111, female,	15 „ „	.....	73	36	12
120, „	18 „ „	.....	70	33	12
121, „	„ „ „	.....	73	36	12
Average of 6 specimens of both sexes :—			72·5	35·3	12

For cranial measurements see Table at p. 828.

The specimens from Great Cumbrae, Bute, Arran, and Mull do

* Collectors' measurements: throughout hind feet without claws, tail without terminal hairs. All dimensions are given in millimetres.

not differ appreciably from examples of *castaneus* from the neighbouring mainland. Skulls of *castaneus* from South-eastern England seem to attain slightly larger dimensions than those from northern Britain, and this may indicate the existence of two forms. The Jura Shrew is interesting in having a pelage intermediate in character between that of *castaneus* and *grantii* described below; in the four skulls seen the dental characters are those of normal *araneus*, and therefore this form must be left with the latter species.

SOREX GRANTII. (Pl. LXXXIV. fig. 1, & text-fig. 136.)

Abstract P. Z. S. 1913, p. 18 (April 15).

Twenty-two, ISLAY.

Dimensions:—

		Head & body.	Tail.	Hind foot.	
No.	Date				
No. 73, male,	24 April 1912	75	36	13	
74, "	" " "	77	36	13	
77, "	26 " "	79	37	13	
80, "	30 " "	80	36	13	
82, "	" " "	80	36	13	
83, "	" " "	80	37	13	
84, "	" " "	78	38	13	
92, "	2 May	78	35	12	
95, "	" " "	75	35	12	
98, "	7 " "	75	35	12	
100, "	8 " "	75	35	12	
101, "	" " "	76	36	12	
105, "	10 " "	75	36	13	
72, female,	23 April	83	37	13	
76, "	26 " "	75	37	13	Type.
81, "	30 " "	78	36	13	
96, "	3 May	77	35	12	
106, "	10 " "	75	35	12	
157, female, juv.,	3 Aug. 1912	75	38	12	
158, "	" " "	80	34	12.5	
161, "	" 5 " "	73	36	12	
165, "	" 8 " "	70	38	12	

Average of 18 adults of both sexes:— 77.3 36 12.6

For cranial measurements see Table at p. 828.

This is a very remarkable new Shrew, distinguishable at a glance from the common British *S. araneus castaneus* by its dusky upper side in strong contrast to the light flanks. The dentition is peculiar in the fact that more than half of the individuals have lost the posterior upper unicuspid, sometimes on one side only, but more frequently on both sides, the absence of this tooth in these cases being compensated for by enlargement of the four remaining unicuspid

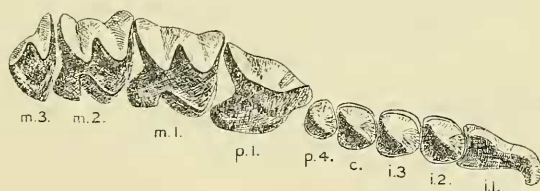
DESCRIPTION.—The size and proportions are about as in *S. araneus castaneus*, but average slightly larger than in north British specimens of the latter.

Colour.—Adults have the upper side deep blackish brown, perhaps darker than “clove-brown”*; slightly grizzled on the upper side of the head and neck with brown; the under side is silvery or smoky grey rather than yellowish or brownish as in *castaneus*, and this colour runs far up the flanks and shows up in contrast to the dark upper side. Between the colours of upper and under sides a narrow, inconspicuous, grey-brown flank-band intervenes; rarely it is “wood-brown,” in which case it contrasts more sharply with the back. Nos. 72 & 76 (23 & 26 April) are moulting into a scarcely less dusky summer coat, but some specimens taken in May and Nos. 157, 161, & 165 (3, 5, & 8 August) are in a lighter brown coat, between “seal-brown” and “clove-brown,” somewhat as in *S. a. castaneus*, with a flank-band near-“wood-brown.” These specimens are no doubt immature and the brown pelage is that of immaturity.

Cranial and dental characters.—The skull agrees in form and size with that of *S. a. castaneus*, but attains rather larger dimensions than skulls of the latter species from northern Britain and the Inner Hebrides (*vide* Table, p. 828). The teeth agree in form with those of *S. araneus*; but the posterior unicuspid (p. 3) tends to disappear as shown by the following statistics:—

p. 3 present on both sides in	7 individuals, <i>i. e.</i> 43·7 per cent.
.. .. on one side only in	4 25 ..
.. absent on both sides in	5 31·3 ..

Text-fig. 136.



Right upper tooth-row of *Sorex grantii*. $\times 8\frac{1}{2}$.

When p. 3 is absent the four remaining unicuspid teeth appear to be somewhat enlarged in compensation (text-fig. 136). There is no trace of pigment on the hypocones of the upper cheek-teeth nor on protocone of the last upper molar.

By colour and dentition *S. grantii* is clearly differentiated from all European members of the genus *Sorex*. Some of these, such as *araneus araneus* and *araneus tetragonurus*, have the back as dark, but none shows the conspicuously contrasted sides.

* The names of colours in inverted commas are from Ridgway.

In our opinion *S. grantii* is to be regarded as an insular development of *S. a. castaneus* stock. It has maintained or acquired slightly larger dimensions than has the latter in the more northern parts of its range: it has developed a peculiar colour pattern, and is well on its way to reduce the number of its unicuspid teeth, perhaps because of a tendency to enlarge the anterior members of the series. The Jura Shrew is geographically and morphologically the connecting link between *S. a. castaneus* and *S. grantii*: it has the small size and dental characters of the northern *castaneus*; but its colour pattern is modified so as to approach that of *S. grantii*.

The species is named in honour of Mr. W. R. Ogilvie-Grant of the British Museum, to whose enthusiasm the formation of the collection described in this paper is so largely due.

SOREX MINUTUS Linnaeus.

Nine, BUTE.

				Dimensions :—		
				Head & body.	Tail.	Hind foot.
No. 18, male, adult,	20 March 1912	...		52	35	10
25, " " "	25 " " "	...		55	35	10
70, " " "	20 April " "	...		55	34	10
2, female "	12 March " "	...		45	32	10
17, " " "	20 " " "	...		55	35	10
19, " " "	" " " "	...		55	33	10
24, " " "	" " " "	...		50	35	10
26, " " "	" " " "	...		55	35	10
69, " " "	20 April " "	...		55	35	10

Average of 9 specimens of both sexes :— 53 34.3 10

All in dark adult pelage, between "seal-brown" and "hair-brown."

Two, ARRAN.

No. 59, male, adult,	11 April 1912	...	58	35	10
51, female, "	6 " " "	...	59	35	11

Average of 2 specimens :— 58.5 35 10.5

In dark adult pelage as above.

Three, ISLAY.

No. 75, male, adult,	26 April 1912	...	60	40	10
85, " " "	30 " " "	...	59	37	10
86, female, "	" " " "	...	57	37	10

Average of 3 specimens of both sexes :— 58.6 38 10

No. 85 is in dark adult pelage as above, Nos. 75 and 86 in juvenile or summer pelage.

One, COLL.

No. 56, female, adult,	23 July 1912	...	60	37	10
------------------------	--------------	-----	----	----	----

Five, TIRREE.

Dimensions:—

			Head & body.	Tail.	Hind foot.
No. 152, male, juv.,	16 July 1912 ...		50	34	10
153, „ „ „ „ „ „	... „ „ „ „ „		50	34	10
154, „ „ „ „ „ „	... „ „ „ „ „		50	34	10
155, „ „ „ „ „ „	17 „ „ „ „ „		50	34	10
151, female, fully grown.	} 16 „ „ „ „ „		60	36	10

The larger specimens from Coll and Tiree are in the light summer coat of young born in the same season; in this pelage the hairs are more plentifully grizzled or peppered with tawny than in adults. The very young specimens show an interesting early pelage, in which the upper side is lighter than in adults, the under side very clear and nearly white.

For cranial measurements see Table at p. 828.

Elsewhere in the Hebrides *S. minutus* is known to inhabit Skye, Eigg, Sanda, Great Cumbrae, Lewis, North and South Uist, Benbecula, and Barra. (Barrett-Hamilton, 'History of British Mammals,' ii. pt. 8, pp. 111-115.)

EVOTOMYS GLAREOLUS BRITANNICUS Miller.

Two, BUTE.

Dimensions:—

			Head & body.	Tail.	Hind foot.	Ear.
No. 6, male, adolescent, 13 March 1912.			90	42	17	10
27, „ „ adult, 21 „ „ „			95	45	18	10

For cranial measurements see Table at p. 830.

With this material we are unable to distinguish the *Evotomys* of Bute from the form inhabiting the mainland. In No. 6 the cement-spaces of the cheek-teeth are just closed; in No. 27 the roots of the cheek-teeth are moderately developed. In each specimen the last upper molar has a third inner fold. The skull agrees in size and general form with that of *britannicus*, but the external measurements indicate a rather smaller animal with slightly larger hind feet than the latter.

EVOTOMYS ALSTONI. (Text-fig. 137.)

Abstract P. Z. S. 1913, p. 18 (April 15).

Five, MULL.

Dimensions:—

			Head and body.	Tail.	Hind foot.	Ear.
No. 134, male, aged, 18 June 1912			108	44	18	11 Type
135, „ „ „ „ „ „			110	44	19.5	11.5
136, „ „ „ „ „ „			103	44	18	11
128, female, „ 13 „ „			105	45	18.5	11.5
130, „ „ „ 14 „ „			100	42	18	10

Average of 5 specimens of both sexes: 105.2 43.8 18.4 11

For cranial measurements see Table at p. 830.

Cranial and Dental measurements of *Sorex*.

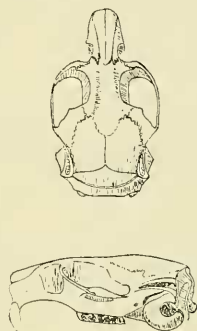
<i>S. araneus</i> <i>castaneus</i> .	Condylar-basal length.	Malar breadth.*	Interorbital breadth.	Width of brain-case.	Depth of brain-case.	Maxillary teeth.	Cheek-teeth (p. 1—m. 3).*	Tooth-row exclusive of inc. 1.*	Mandible.	Tooth-row exclusive of incisor.*	m. 1 to m. 3.*	Coronoid height.*	Condyle to anterior border of coronoid process.*	Height of ramus below m. 2.*
JURA.														
No. 111	18.7	5.06	3.5	9.0	4.7	8.2	4.4	6.93	9.3	5.17	3.52	4.51	2.8	1.32
120	18.2	5.17	3.5	9.2	5.0	7.7	4.29	6.6	9.3	5.17	3.52	4.29	2.75	1.43
MULL.														
No. 142	18.7	4.84	3.5	9.0	...	8.1	4.51	6.93	9.4	5.28	3.63	4.4	2.86	1.32
143	19.0	5.28	3.9	9.6	5.1	8.1	4.4	7.04	9.8	5.28	3.57	4.51	3.08	1.32
144	17.7	4.84	3.3	8.9	4.9	7.6	4.18	6.49	9.0	4.95	3.52	4.4	2.86	1.32
BUTE.														
No. 13	18.4	5.06	3.5	9.2	4.8	8.0	4.4	6.93	9.3	5.17	3.63	4.4	2.86	1.32
14	18.4	4.95	3.5	9.0	4.8	7.9	4.4	6.82	9.3	5.06	3.52	4.4	2.97	1.32
15	17.9	5.28	3.5	9.1	5.0	7.8	4.29	6.71	9.0	5.06	3.52	4.45	2.86	1.32
16	18.5	5.12	3.5	9.2	4.9	7.9	4.29	6.82	9.2	5.17	3.63	4.4	2.86	1.43
68	18.1	5.06	3.5	9.2	5.2	7.7	4.34	6.65	9.1	5.06	3.52	4.29	2.91	1.32
CUMBRAE.														
No. 32	18.7	5.06	3.7	9.1	...	7.8	4.29	6.71	9.4	5.06	3.52	4.4	2.91	1.37
34	18.9	5.28	3.7	...	...	7.9	4.29	6.93	9.7	5.17	3.52	4.51	2.97	1.32
39	18.3	5.06	3.5	8.9	4.8	8.0	4.29	6.71	9.5	4.95	3.46	4.4	2.86	1.32
ARRAN.														
No. 57	18.2	5.06	3.6	8.9	...	7.8	4.29	6.71	...	5.06	3.46	4.51	2.97	1.43
58	18.6	5.22	3.6	9.4	5.0	8.0	4.4	6.93	9.3	5.11	3.57	4.62	2.97	1.37
<i>S. grantii.</i>														
ISLAY.														
No. 73	19.1	5.28	3.7	9.3	...	8.1	4.4	6.93	9.6	5.17	3.52	4.51	2.75	1.48
74	19.3	5.39	3.8	9.6	5.0	8.4	4.62	7.15	9.9	5.28	3.63	4.55	2.8	1.43
Type 76	19.0	5.28	3.8	9.1	5.2	8.3	4.62	6.93	9.9	5.17	3.57	4.51	2.97	1.32
77	18.9	5.39	3.8	9.3	5.1	8.2	4.4	6.82	9.7	5.17	3.63	4.56	2.86	1.37
80	18.8	5.28	3.8	9.4	5.2	8.1	4.4	6.82	9.6	5.17	3.63	4.62	2.97	1.43
83	19.0	5.5	3.8	9.2	5.1	8.4	4.62	7.2	9.9	5.39	3.63	4.62	2.97	1.43
84	19.1	5.28	3.8	9.2	5.2	8.2	4.51	6.93	9.8	5.28	3.63	4.62	2.97	1.43
95	18.6	5.17	3.8	8.9	5.0	8.1	4.4	6.82	9.4	5.17	3.63	4.51	2.86	1.32
100	18.2	5.17	3.5	9.0	5.0	7.8	4.29	6.71	9.4	5.17	3.57	4.4	2.75	1.37
101	18.5	5.33	3.7	9.2	5.0	7.9	4.29	6.71	9.6	5.06	3.46	4.67	2.8	1.43
105	18.4	5.39	3.8	9.4	5.0	7.9	4.29	6.6	9.6	5.06	3.52	4.62	2.86	1.32
106	18.6	5.17	3.7	9.1	5.1	7.9	4.4	6.71	9.3	5.17	3.57	4.4	2.86	1.32
<i>S. minutus.</i>														
BUTE.														
No. 2	15.2	4.67	2.7	7.3	3.5	6.5	3.52	5.4	7.3	4.07	2.97	2.97	2.14	0.88
17	15.5	4.18	2.7	7.2	4.0	6.6	3.74	5.61	7.7	4.29	3.08	3.08	2.2	0.88
24	15.2	3.96	2.7	7.2	4.0	6.3	3.52	5.39	7.4	4.07	2.86	2.97	2.14	0.88
25	15.2	3.96	2.8	7.3	4.0	6.3	3.52	5.39	7.4	4.07	2.97	2.97	2.14	0.88
26	15.0	3.96	2.8	7.3	4.0	6.2	3.47	5.8	7.3	4.07	2.86	2.97	2.2	0.88
69	15.3	3.96	2.7	7.1	4.0	6.3	3.52	5.5	7.4	4.07	2.97	3.08	1.98	0.77
ARRAN.														
No. 51	15.9	4.18	2.8	7.1	4.0	6.8	3.85	5.83	7.8	4.18	3.08	3.08	2.2	0.88
59	15.9	4.18	2.8	7.2	4.0	6.6	3.74	5.72	7.8	4.29	3.14	3.08	2.2	0.88
ISLAY.														
No. 85	15.4	...	2.7	7.2	4.0	6.5	3.74	5.61	7.6	4.23	3.08	3.08	2.25	0.94
86	15.6	4.18	2.8	7.3	4.0	6.5	3.74	5.61	7.6	4.18	3.08	3.08	2.31	0.88

* These measurements were made with an eyepiece micrometer and 5-inch objective, vide Hinton, "British Fossil Shrews," Geol. Mag. n. s., dec. 5, vol. viii. pp. 537 & 538.

General characters.—This mouse is a little larger than *E. glareolus*, approaching *E. norvegicus*, but the tail is shorter than in the latter, and about as in *glareolus*; smaller than *E. skomerensis* or *cesarius*. The ears are about as in *E. glareolus*. The hind feet are as in *norvegicus* and *skomerensis*.

Cranial and dental characters.—In size the skull is larger than in *E. glareolus* and agrees with that of *norvegicus*. As in the latter form, the jugals are heavy, but the curvature of the zygomatic arches agrees with *glareolus*. The brain-case is very broad and

Text-fig. 137.

Dorsal view and profile of skull of *Eutamias alstoni*. Natural size.

smoothly convex, the temporal ridges being but faintly indicated even in aged skulls: the parietal region is convex in dorsal profile, with the highest point a little behind the middle of the parietals, instead of flattened; these features impart an appearance of relatively greater cranial capacity than is seen in any of the other European species of *Eutamias*. The postorbital (squamosal) processes are not conspicuous. The interorbital region is broad, with a wide shallow median sulcus. The nasals are rounded or slightly and narrowly emarginate behind, ending flush with or slightly behind the ends of the premaxillæ; they are slightly longer than the diastema, expanded in front, their lateral borders slightly but distinctly concave. The rostrum is shallow, as in *E. norvegicus*, its least depth behind the incisors not exceeding the anterior width. The bullæ are nearly as in *norvegicus*. The last upper molar has a third inner fold and fourth inner salient angle—the latter being usually well developed.

The colour is much darker than in *E. skomerensis*, but is very similar to that of *E. glareolus*, being deep russet above; the under side is richly washed with yellowish or buff.

This is an interesting and quite distinct species, recognizable externally by its generally large size combined with small ears and short tail, while in addition its skull characters are quite distinctive. On the whole it makes a nearer approach to *E. norvegicus* than to any other species of *Eutamias*.

Cranial measurements of *Evotomys*.

	Condyllo-basal length.	Zygomatic breadth.	Interorbital constriction.	Mastoid breadth.	Occipital depth (median).	Nasal.	Diastema.	Maxillary tooth-row (alveolar).	Mandible.	Mandibular tooth-row (alveolar).	
<i>E. glar. britannicus</i> .											
Chingford, ESSEX.....	24.2	14.0	3.9	11.2	6.0	6.8	6.5	5.5	14.5	5.1	Aged.
BUTE, No. 27, male	23.5	12.8	3.8	11.2	6.0	6.7	6.4	5.4	14.6	5.4	Adult.
<i>E. alstoni</i> .											
MULL, No. 134, male ...	25.3	13.9	3.8	11.5	6.4	7.5	7.1	5.6	15.6	5.4	Aged.
" 135, "	25.3	14.3	3.9	12.1	6.6	7.8	7.7	5.7	15.7	5.4	"
" 136, "	24.9	14.5	4.1	11.8	6.3	7.3	6.8	5.6	15.3	5.1	"
" 130, female	24.1	13.5	3.9	11.4	6.0	6.8	6.3	5.2	15.1	5.4	"
<i>E. norvegicus</i> .											
Hardanger, 5.8.5.2	24.5	13.4	3.8	11.1	6.0	6.9	7.0	5.4	15.3	5.1	Aged.
Bergen, max. (Miller) ...	26.2	14.6	4.0	12.0	6.6	8.0	7.8	5.8	16.0	5.4	Adult.

MICROTUS AGRESTIS EXSUL Miller. (Text-fig. 138 A.)

Four, MULL.

Dimensions:—

No.				Head & body.	Tail.	Hind foot.	Ear.
No. 139, male, ad.,	21 June	1912.		125	36	19	12
141, " juv.,	27 "	"		100	30	18	11
132, female, subad.,	15 "	"		115	32	17.5	12
145, " juv.,	3 July	"		105	30	18.5	11

Eight, ARRAN.

No. 41, male, ad.,	2 April	1912.	125	35	19	12
42, " juv.,	3 "	"	105	32	19	11
46, " subad.,	4 "	"	117	33	19	13
50, " "	5 "	"	115	32	18	12
52, " "	6 "	"	112	30	19	12
62, " adult,	15 "	"	125	36	19	14
43, female, juv.,	3 "	"	105	32	19	11
47, " subad.,	4 "	"	115	12	19	12

(damaged)

One, GIGHA.

No. 127, male, adult,	23 May	1912.	125	33	18	12
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Eight, JURA.

Dimensions :—

				Head & body.	Tail.	Hind foot.	Ear.
No. 109,	male,	subad.,	15 May 1912.	115	30	19	13
118,	"	"	16 " "	118	31	19	12
116,	"	"	17 " "	115	32	20	11.5
114,	female,	"	16 " "	120	34	19	12
115,	"	"	" " "	115	32	19	12
117,	"	"	17 " "	110	30	18	12
119,	"	adult,	" " "	125	35	19	12
124,	"	subad.,	18 " "	115	32	19	12

For cranial measurements see Table at p. 834.

M. agrestis exsul Miller, of which, in addition to the material in the British Museum, we have examined several specimens from North and South Uist, kindly lent by Mr. Eagle Clarke, of the Royal Scottish Museum, Edinburgh, is a thick-coated form with light upper side and flanks, and under side heavily washed with buff. The fur of the back in winter reaches a length of about 12 mm., including the light tips of about 2-3 mm.; the longer hairs reach about 15 mm. We are not able to distinguish the specimens from Mull, Arran, Gigha, and Jura from this subspecies. Those from Mull are practically quite typical.

The following Table shows the character of the anterior upper cheek-tooth in the skulls examined :—

	MULL.	ARRAN.	GIGHA.	JURA.
4th inner angle quite absent...	...	...	...	1
„ represented by microscopic } 2 juv.	5	1	4	12
vestige	1	4	...	3
„ small but distinct.....	1	4	...	3
Specimens examined	3	9	1	8
	3	9	1	8

Some features of the skull are discussed below in connection with the form living in Islay.

MICROTUS AGRESTIS MACGILLIVRAIL. (Text-fig. 138 B.)

Abstract P. Z. S. 1913, p. 18 (April 15).

Fourteen, ISLAY.

Dimensions :—

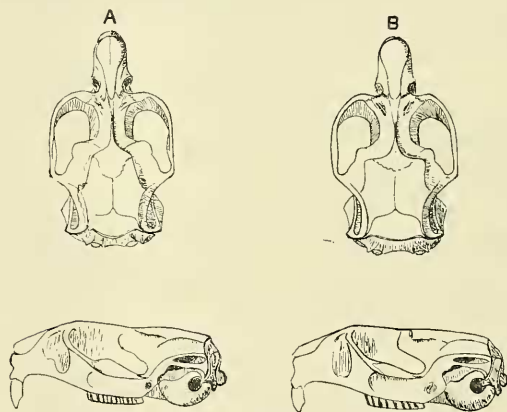
				Head & body.	Tail.	Hind foot.	Ear.
No. 78,	male,	subad.,	26 April 1912.	115	34	19	13
79,	"	juv.,	" " "	90	27	18	10
88,	"	adult,	30 " "	125	40	19	12
89,	"	subad.,	" " "	115	31	19	12
90,	"	"	2 May " "	115	37	19	13
102,	"	adult,	8 " "	125	32	19	...Type

			Head & body.	Tail.	Hind foot.	Ear.
No. 103,	male, juv.,	9 May 1912.	105	34	18	11
107,	„ adult,	10 „ „	125	37	19	15
159,	„ subad.,	3 August „	110	35	19	12
153,	„ „	7 „ „	118	35	18	12
87,	female, „	30 April „	115	33	19	12
91,	„ adult,	2 May „	120	32	19	13
160,	„ subad.,	3 August „	115	34	19	12
162,	„ „	6 „ „	108	33	18	12

For cranial measurements see Table at p. 834.

This mouse resembles *M. agrestis exsul* in size and general proportions, but may be recognized at all seasons by its much thinner coat and the much lesser amount of yellowish wash on the under side, resulting in the slaty bases of the hairs being visible and taking part in the general coloration; the under side thus resembles that of immature *exsul*. The upper side is slightly less brightly coloured than in *exsul*; the hairs of the back reach a length of about 8 mm.

Text-fig. 138.



Dorsal view and profile of skulls of (A) *Microtus agrestis exsul* and (B) *M. a. macgillivraii*. Natural size.

A quite young male (No. 79) is in dusky pelage, with very slight development of the light hair-tips. The hair-tips of the under side are of a very light tint, increasing in depth through the flanks to the back and poll, where they are deepest but never approach the rich buff of adults. The rump of this specimen is more dusky than the back.

In each of the eight skulls examined the anterior upper cheek-

tooth has a distinct and often rather large fourth inner angle. As is usual in microtine subspecies, the subspecific cranial characters first become obvious in old age, although, if care be taken to compare only skulls of equal age, close observation will find the beginnings of such characters in younger stages too. The oldest skull, the type (No. 102), is fairly comparable with that of No. 139, a *M. a. exsul* from Mull, from which it is distinguished by its deeper rostrum, lighter jugals, and more nearly vertical occiput; because the occiput is less sloping the interparietal is a little less reduced,—its posterior border is straight instead of sinuous, and it is rather longer antero-posteriorly. The most striking difference is seen, however, in the form of the “shield” or flattened dorsal area delimited by the temporal ridges upon the sides of the braincase. In *exsul* (text-fig. 138 A) that part of the temporal muscle which arises between the interorbital region and the glenoid articulation continues apparently throughout life to extend its area of origin by creeping up the sides of the braincase and so pushing the temporal ridge backward; the result is that in old age the anterior width of the “shield,” taken between its antero-external angles, is considerably less than its glenoid width: in the Islay mouse the upward creeping of the temporal muscle ceases at a relatively early stage of growth, and the result is that in old age the “shield” presents a form which is found only in relatively early stages of development in *exsul*. The oldest skull of *exsul* from South Uist (Edinburgh, No. 300) is younger than the skulls from Islay and Mull just described, the temporal ridges not yet being quite fused in the interorbital region, but the form of the “shield” is already more modified than in the aged type of the present subspecies.

MICROTUS AGRESTIS NEGLECTUS Jenyns.

Three, BUTE.

Dimensions:—

	Head & body.	Tail.	Hind foot.	Ear.
No. 67, male, juv., 19 April 1912.....	98	26	17	12
3, female, „ 12 March „ 100	100	26	16	11
64, „ „ 18 April „ 95	95	24	16	11.5

For cranial measurements see Table at p. 834.

The short tails are, no doubt, due to immaturity.

Making allowance for the youth of these specimens, we can detect no character by which the skins or skulls can be differentiated from those of *M. agrestis neglectus* of the mainland.

In his recently published ‘Catalogue of the Mammals of Western Europe’ (1912), Mr. Miller treats the various *agrestis*-like forms as subspecies. We think it preferable, somewhat as proposed by Barrett-Hamilton in 1896 (P.Z.S. 1896, 19th May, pp. 599-608), to regard these forms as belonging to two species,

a larger northern with isolated southern colonies, now known to be older in western Europe, a smaller southern, now known to be a recent comer. Such an arrangement shows the relationships most clearly. The earliest known member of the group in Europe is a species of which the fossil and fragmentary remains have been found in the early middle pleistocene brickearth of the Thames at Grays in Essex; whether this form has any close affinity with any living now it is impossible to say. In the late pleistocene deposits of Britain, such as that filling the Ightham Fissures, and in many of the caves, remains of a large form not certainly distinguishable, with the available materials, from *M. agrestis neglectus* occur. The Skandinavian *agrestis*, the Hebridean *exsul* and *macgillivraii*, the pleistocene and recent British *neglectus*, together probably with the southern French and Swiss *levernedii*, are all intimately connected forms and may be regarded as subspecies of *M. agrestis*, and of them *macgillivraii* may be counted as the most primitive. At some time since the close of the pleistocene period *M. agrestis neglectus* has been succeeded in England and the lowlands of Scotland by a smaller, brighter form, which being a newer immigrant, may well be granted specific rank as *M. hirtus* Bellamy, with *M. hirtus bailloni* de Selys of France as a subspecies.

Cranial measurements of *Microtus agrestis*.

		Condylar-basal length.	Zygomatic breadth.	Interorbital constriction.	Mastoid breadth.	Occipital depth (median).	Nasal.	Diastema.	Maxillary cheek-teeth (alveolar).
<i>M. a. exsul.</i>									
MULL.	No. 139, male.	28.6	16.2	3.4	12.5	7.1	8.4	8.1	6.9
ARRAN.	43, juv. f.	26.8	15.2	3.4	11.6	6.2	6.8	7.4	6.9
	52, „ m.	27.0	15.8	3.5	12.5	6.4	7.5	7.4	7.0
JURA.	119, female	27.3	16.5	3.4	12.5	6.7	7.8	7.5	7.0
N. UIST.	372, „	26.5	14.6	3.3	11.6	6.4	7.5	7.6	6.8
S. UIST.	300, „	27.8	16.3	3.3	12.4	6.8	7.9	7.8	6.5
<i>M. a. macgillivraii.</i>									
ISLAY.	No. 89, male.	26.4	15.3	3.8	12.0	6.7	7.9	7.2	6.6
	78, „ ...	26.5	15.3	3.6	11.8	6.2	7.6	7.5	6.7
	103, „ ...	26.6	15.4	3.7	12.0	6.2	7.6	7.4	6.8
	87, female.	27.4	16.0	3.7	12.1	6.6	7.9	7.7	6.8
	102, Type ...	28.7	16.4	3.7	12.6	6.7	8.7	7.8	7.1
<i>M. a. neglectus.</i>									
BUTE.	No. 67, juv. m.	24.3	14.0	3.6	11.5	6.0	6.8	6.9	6.1
	3, „ f.	24.4	14.1	3.3	10.8	6.1	6.8	6.8	6.7

APODEMUS SYLVATICUS SYLVATICUS Linnæus.

Seventeen, BUTE.

Seventeen, BUTE.					Dimensions :—				
No.	1,	male,	9 March 1912.		Head & body.	Tail.	Hind foot.	Ear.	Skull c.-b. l.
					95	78	21	15.7 *	
	4,	"	12	"	90	80	22.7	15.5	
	7,	"	13	"	90	80	23	15	22.5
	10,	"	16	"	90	75	22.5	15 †	22.5
	12,	"	17	"	90	77	21.7	15	
	21,	"	20	"	100	86	22.5	15	23.2
	23,	"	"	"	87	76	22	14	21.5
	28,	"	21	"	95	85	22.5	15	23.1
	31,	"	23	"	95	75	22	12.5 ‡	22.0
	5, female,	12	"	"	80	78	23	14.5	21.5
	8,	"	13	"	88	75	22	14.7	22.2
	9,	"	14	"	90	75	22.7	13.5	22.4
	11,	"	16	"	85	73	21	16	21.0
	20,	"	20	"	90	90	22	15	22.8
	22,	"	"	"	83	67	20.5	14.5	20.4
	29,	"	21	"	80	80	21	14.5	21.8
	30,	"	22	"	80	73	22.3	16	21.6
Average of 17 specimens of both sexes					88.7	77.8	22	14.76	

Six, GREAT CUMBRAE.

No.									
33,	male,	27 March 1912.			95	92	23	15	23.4
35,	"	28 "	"	"	95	90	22	14.5	22.8
36,	"	29 "	"	"	95	92	23	16	
37,	"	"	"	"	90	88	23	16	
38,	female,	"	"	"	93	90	23	15	23.2
40,	"	30 "	"	"	90	90	23	16	22.4
Average of 6 specimens of both sexes					93	90.3	22.8	15.4	

A rather rufous series, perhaps due to late winter coat being worn.

Nine, ARRAN.

No.									
44,	male,	3 April 1912.			100	88	24	14.5	
48,	"	4 "	"	"	105	83	24	15	24.0
49,	"	"	"	"	105	86	23.5	14	
53,	"	6 "	"	"	100	85	23	14	23.6
54,	"	"	"	"	100	88	23.7	15	
45,	female,	3 "	"	"	90	81	24	14	22.6
55,	"	6 "	"	"	95	85	23.5	15.5	23.4
56,	"	9 "	"	"	95	...	23	14	24.0
61,	"	11 "	"	"	95	80	23	14.5 §	23.6
Average of 9 specimens of both sexes					98.3	84.5	25.5	14.5	

This series shows a rather large reddish mouse, with a tendency towards the large foot and short ear of *hebridensis*.

* Trapped on moss-covered bank.

† Trapped in grass near sea-shore.

‡ Trapped in middle of rough pasture.

§ Trapped in heather on side of cliff.

One, GIGHA.

Dimensions:—

	Head & body.	Tail.	Hind foot.	Ear.	Skull c.-b. l.
No. 126, female, 22 May 1912.	100	85	22.5	15	

A rather large nursing specimen with dimensions tending towards those of *hebridensis*.

Ten, ISLAY. (8, Sheppard; 2, Royal Scottish Museum.)

No. 97, male, 3 May 1912.	83	74	23	13	
99, " 7 " "	98	78	23.5	13.5	23.0
93, female, 2 " "	88	80	22	15	22.1
94, " " " "	100	88	23	15	24.1
104, " 9 " "	95	85	22	14	23.7
164, " 7 Aug. "	90	80	22.5	13	
166, " 8 " "	90	75	22	13	
167, " juv. 8 " "	65	64	17	8	

Royal Scottish Museum:—

No. 397, female,	101	85	22	14.5	
398, "	95	90	23	15	
Average of 9 adults of } both sexes	93.3	81.6	22.5	14	

A moderately large mouse, with back heavily washed with black, probably indicating the new summer coat; stomach clear white, and slight trace of yellow collar.

Three, JURA.

No. 122, male, 18 May 1912.	98	84	24	14.5	
123, " " " "	100	...	22	14.5	23.9
113, female, 16 " "	95	73	22	14.5	23.5
Average of 3 specimens } of both sexes	97.6	78.5	22.6	14.5	

Five, MULL.

No. 129, male, 13 June 1912.	95	92	22.5	14	
131, " 15 " "	98	90	24	15	23.2
133, " 18 " "	100	87	22	14	23.8
137, " 20 " "	92	88	24	14.5	
140, " 22 " "	100	80	24	14.5	24.2
Average of 5 males	97	87.4	23.2	14.4	

Four, TIRRE.

No. 146, male, 8 July 1912.	105	88	23.5	13.5	
148, " 10 " "	105	88	24	13	
149, " 12 " "	100	73	23	14	
150, female, 13 " "	100	88	22	13.5	
Average of 4 specimens of } both sexes	102.5	84.25	23.1	13.5	

Six from Tiree, in Royal Scottish Museum:—

No.	Sex & Date	Head & body.	Tail.	Hind foot.	Ear.
No. 344,	male, 19 Nov. 1906.	80	85	23·5	14
385,	„ 19 Feb. 1907.	95	89	23	15·5
342,	female, 19 Nov. 1906.	86	90	22	14
343,	„ „ „ „	82	85	23	14
345,	„ „ „ „	75	74	21	13
346,	„ „ „ „	82·5	86	23	15
Average of 6 specimens of both sexes		83·4	84·8	19·2	14·2
Average of 10 specimens of both sexes		92·9	84·5	21·1	13·8

The specimens from Tiree and Mull are, when adult, apparently above the average size, and tend to have the large hind feet and small ears of *hebridensis*. They also approach *hebridensis* in a tendency to have the under side washed with yellow.

Cranial measurements of *Apodemus sylvaticus sylvaticus*.

	Condylar-basal length.	Zygomatic breadth.	Interorbital constriction.	Mastoid breadth.	Depth of brain-case.	Nasals.	Diastema.	Maxillary cheek-teeth (alveolar).	Mandible.	Mandibular cheek-teeth (alveolar).	
Bute, 21, male	23·2	13·0	4·0	11·2	8·0	10·2	6·6	3·9	14·2	3·6	Aged.
„ 28, „	23·1	12·8	3·9	11·2	8·0	9·5	6·7	4·0	14·3	3·8	Adult.
Cumbræ, 38, female.	23·2	13·2	3·8	11·8	8·2	9·2	6·8	3·9	14·5	3·6	Aged.
Arran, 48, male	24·0	13·6	4·0	12·0	8·3	9·6	6·8	4·2	14·9	3·7	Adult.
Islay, 94 female	24·1	14·0	4·1	11·4	7·8	...	7·0	3·7	14·9	3·7	Aged.
Jura, 123, male	23·9	13·0	4·0	11·6	8·2	9·4	7·0	4·0	14·4	3·8	Adult.
Mull, 140, „	24·2	13·0	4·2	11·7	8·1	10·2	7·4	4·1	14·7	3·8	Aged.

We are unable to distinguish the specimens from the islands from *A. sylvaticus sylvaticus* of the mainland. The dimensions recorded above afford an idea of the variability encountered in this form: even allowing for errors on the part of the collector, and for the differing ages of individuals, there seems to be an inherent tendency to vary. On all the islands, except Bute and Great Cumbræ, there is a dimly seen tendency to acquire greater size, larger hind feet, and shorter ears, *i. e.*, a tendency to vary in the same direction as *hebridensis*, as further shown by the specimens from Tiree and Mull, in which the belly tends to be washed with yellowish tints.

MUS MUSCULUS Linnaeus.

One, TIREE.

Dimensions:—

	Head & body.	Tail.	Hind foot.	Ear.
No. 147, male, 10 July 1912...	80	77	18?	11?

An example in the yellowish outdoor pelage. It was trapped in sand-hills.

In conclusion we have to sum up the distributional evidence and offer a few remarks, of a quite tentative character, upon its meaning as it appeals to us at present. Of the shrews, *S. minutus* occurs throughout the Outer and Inner Hebrides, and in the Orkneys, Ireland, and other islands; *S. araneus*, on the other hand, is confined to the mainland, the Inner Hebrides and such islands as Anglesea and Wight; it is represented in Islay by the peculiar *S. grantii* connected morphologically and geographically with the parent form by means of the partially differentiated Jura form. We may therefore perhaps conclude that *S. minutus* was the first form to arrive in this region; but this point is of little importance, because both species have had representatives in Britain from an extremely early period, and the problem before them in the past may have simply resolved itself into a contest of endurance to decide which of them could survive the rigours of the glacial period in the outlying districts. Be this as it may, one fact stands out clearly, that Islay has been separated from the mainland longer than have the other islands of the Inner Hebrides, with Jura approaching it in age. The microtine species lead us to much more definite conclusions. We have in the Inner Hebrides two genera, *Microtus* and *Erotomys*; the former alone, so far as is known, inhabits the Outer Hebrides as well. As is well known, neither genus occurs in Ireland, and *Microtus* alone is met with in the Orkneys. There is a great difference, however, between the Orcadian and the Hebridean species of *Microtus*: the Orcadian forms are members of the *M. arvalis* group, while those of the Hebrides are members of the *M. agrestis* group. Now, at first sight, having regard to the fact that *M. orcadensis* and *M. sandayensis* have a near ally in the Guernsey *M. sarnius* and another in the late pleistocene English *M. corneri*, as well as to the fact that this group is no longer represented on the mainland of Britain, one might feel inclined to look upon the Orcadian fauna as an older one than that of the Hebrides. On the other hand, we have to remember that both the *M. agrestis* group and the genus *Erotomys* appeared in Britain long before any of the other modern groups of Voles. Each is represented in such an early horizon as that marked by the Grays brickearth by a form much like the living ones; while

the *M. arvalis* group in a modern guise does not appear until the late pleistocene era. Secondly, we have to face the remarkable fact that both *E. alstoni* and *M. agrestis exsul*, with its ally *macgillivraii* from Islay, are most closely related to the Skandinavian species. Moreover, *M. agrestis macgillivraii* appears to be a little more primitive in its organization than *exsul*; the latter form in turn a little more primitive than true *agrestis*. The interpretation of these peculiar facts which we suggest is that the Hebrides have formed a refuge for some very old mammals; that from the former continuous land area, of which they are now the disconnected remnants, certain of these old mammals were dispersed along former land bridges to Scandinavia. The proximity of the Atlantic would ensure the existence of much milder conditions in the Hebridean area during the glacial period, at whatever moment in pleistocene time that remarkable event transpired, than would be present elsewhere to the east. It will be seen therefore that we are practically in full accord with the views put forward by Mr. L. Stejneger in his very able and suggestive paper "On the origin of the so-called Atlantic Animals and Plants of Western Norway" (Smithsonian Misc. Coll. vol. xlviii, p. 458, 1907). Just as the presence of *S. grantii* implies that Islay was separated from the mainland at an earlier date than were the other islands of the Outer Hebrides, so the existence upon it of *M. agrestis macgillivraii* and of a distinct subspecies of Stoat, *Mustela erminea ricinae* (found in Jura as well), may be taken as evidence that it was detached from the common Hebridean land surface at a relatively early moment.

The early detachment of Islay and its peculiar mammals has an important bearing on the origin of the Irish Fauna. It indicates that Islay and Ireland have not been connected since the genus *Microtus* and *Sorex araneus* reached the Inner Hebrides. And if that were so, the existence of the deep North Channel between Ireland and South Scotland must at the same time have interrupted communications in that direction also. We are thus unable to accept E. R. Alston's suggestion (Fauna of Scotland, 1880, p. 5) that Ireland received its mammals from Southern Scotland, and are forced to derive the Irish Fauna from England and Wales (see Barrett-Hamilton, Clare Island Survey, Mammalia, Proc. Roy. Irish Acad., March 1912).

EXPLANATION OF PLATE LXXXIV.

Fig. 1. *Sorex grantii*. Natural size.

2. *Sorex araneus castaneus*. Natural size.